



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/573,038	03/22/2006	Masakazu Oka	Q77833	4422

23373 7590 01/12/2007
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER

NGUYEN, NGOC YEN M

ART UNIT	PAPER NUMBER
----------	--------------

1754

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/573,038

Applicant(s)

OKA, MASAKAZU

Examiner

Ngoc-Yen M. Nguyen

Art Unit

1754

– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.138(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 12-14 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Anania et al (4,900,530).

Anania '530 discloses silicon tetrafluoride, SiF₄, which is the same as the claimed tetrafluorosilane, having the following impurities: boron, lower than 1 ppb (w/w); phosphorus lower than 10 ppb (w/w) and arsenic, lower than 4 ppb (w/w).

The silicon tetrafluoride is suitable for preparing elemental silicon for specialized used such as in solar cells, and in electronics, such as semiconductors (note column 4, lines 40-43). For other use, the "for production..." is considered as an intended use and given little weight in determining the patentability of the product claim.

The silicon tetrafluoride product of Anania '530 anticipates the product claims.

Art Unit: 1754

Alternatively, the process limitations in claims 12-14 are noted. However, when the examiner has found a substantially similar product as in the applied prior art, the burden of proof is shifted to applicant to establish that their product is patentably distinct and not the examiner to show the same process of making. *In re Brown*, 173 USPQ 685 and *In re Fessmann*, 180 USPQ 324.

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anania et al (4,900,530) in view of Kitsugi et al (4,457,091).

Anania '530 discloses a process for the preparation of silicon tetrafluoride comprising:

(a) contacting a 12-20% (w/w) aqueous solution of fluorosilicic acid with 90-100% (w/w) of an aqueous solution of sulphuric acid at a contact time of at least 1 second, in a reaction zone, said reaction zone operating at a temperature of from 90°C. to 120°C. and under a pressure greater than 30 kPa, said contacting resulting in the liberation of a gaseous stream of silicon tetrafluoride;

(b) separating said gaseous stream of silicon tetrafluoride from a liquid stream of a diluted aqueous solution of sulphuric acid produced in a separation zone, said separation zone operating at a temperature of from 70°C. to 120°C. and connected directly with and positioned below said reaction zone;

(c) washing said gaseous stream of silicon tetrafluoride with cold sulphuric acid having a concentration of at least 96% (w/w), in a washing zone; said cold sulphuric

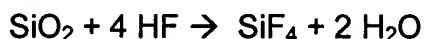
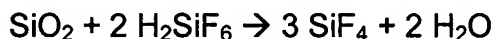
Art Unit: 1754

acid having a temperature higher than the freezing point of said sulphuric acid to 10°C.,
and

(d) contacting said stream of gaseous silicon tetrafluoride with activated charcoal.

The use of any other known adsorbent for removing impurities in step (d) is not seen as a patentable difference. It would have been obvious to one skilled in the art to optimize the pore size of the adsorbent to adsorb only the impurities, not the silicon tetrafluoride product.

Anania '530 further discloses that powder silica is introduced together with the aqueous solution of fluorosilicic acid and in this way, the amount of hydrofluoric acid is reduced, due to the occurrence of the reactions:



The difference is Anania '530 does not disclose the presence of hexafluorodisiloxane, $(\text{SiF}_3)_2\text{O}$, and the step of removing it.

Kitsugi '901 discloses that it is almost inevitable that silicon tetrafluoride gas prepared by reaction between silica sand, silica gel or a silicate with hydrogen fluoride or hydrofluoric acid contains a certain amount of hexafluorodisiloxane as impurity matter (note equations (1)-(2) and column 1, lines 27-31). Kitsugi '901 further discloses a process for removing the hexafluorodisiloxane comprising the step of making the silicon tetrafluoride contact with hydrogen fluoride in the presence of a liquid medium, which has strong affinity for water thereby forcing, said

Art Unit: 1754

hexafluorodisiloxane to react with hydrogen fluoride (note claim 1 and equation (3) in column 1) to form additional silicon tetrafluoride and water. The inorganic acid can be sulfuric acid containing at least 70% by weight of H_2SO_4 (note claim 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to remove the hexafluorodisiloxane impurity from the silicon tetrafluoride product of Anania '530 by contacting the silicon tetrafluoride with hydrogen fluoride in the presence of concentrated sulfuric acid, as suggested by Kitsugi '901 because Kitsugi '901 fairly teaches that such impurity is almost inevitable.

Then Anania '530 is taken in view of Kitsugi '901, there would be at least three different reactions in the process of the combined teaching:

1. H_2SiF_6 (in concentrated H_2SO_4) \rightarrow SiF_4 + 2 HF (note first equation in column 3 of Anania '530)
2. SiO_2 + 4 HF \rightarrow SiF_4 + 2 H_2O (note last equation in column 4 of Anania '530)
3. $(\text{SiF}_3)_2\text{O}$ + 2 HF (in concentrated H_2SO_4) \rightarrow 2 SiF_4 + H_2O

Since reactions (1) and (2) occur first to thereby produce the by-product hexafluorodisiloxane in reaction (3), instead of adding fresh HF, fresh concentrated sulfuric acid, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a portion of the reaction product of reaction (1), which contains concentrated sulfuric acid and HF just as required in reaction (3), to carry out reaction (3) because doing so, the $(\text{SiF}_3)_2\text{O}$ can still be effectively removed while minimizing the required amount of fresh HF and concentrated sulfuric acid.

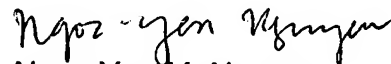
Art Unit: 1754

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner is currently on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Stanley Silverman can be reached on (571) 272-1358. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 or (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed (571) 272-1700.


Ngoc-Yen M. Nguyen
Primary Examiner
Art Unit 1754

nmn
January 7, 2007